

REMARKS/ARGUMENTS

This communication is in response to the Office Action dated September 25, 2009. Claims 1-19 are pending in the present application. In the Office Action, claims 1-19 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Claims 1-4, 6, and 7 were rejected under 35 U.S.C. § 102(b) as being anticipated by US Pat. 6,580,936 (Muraki *et al.*). Claims 5 and 8-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Muraki *et al.* in view of US Pat. 4,945,478 (Merickel *et al.*). Applicant appreciates the Examiner's indication that claims 16 and 17-19 would be allowable if rewritten to overcome the rejections under §101 and, for the reasons presented below, requests reconsideration of the claims of the present application.

1. Claims rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Claims 1-19 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Applicant respectfully disagrees with this assertion as the method of the claimed invention is both (1) tied to a particular apparatus and (2) transforms underlying subject matter.

Regarding point (1), claim 1 is tied to a particular apparatus in a magnetic resonance imaging (MRI) system. The first step of claim 1 clearly, and positively, recites that a plurality of image data sets are acquired using the MRI system. Thus, the method of the present invention is intimately tied to an MRI system and, as such, it is directed to patent eligible subject matter. Indeed, the present invention employs an MRI system, thus tying the method of the present invention to a new, useful, and non-obvious use of such an MRI system. For at least the foregoing reasons, the method called for in claim 1 is directed to patent eligible subject matter. The assertion that, because "the tied-machine (MRI system) performs the pre-solution activity so [that the] claimed MRI system does not qualify as a 'particular machine' as set for in *Bilski* [sic]," is improper. Rather, as expressly claimed, the MRI system must be utilized in a particular manner to reach the claimed "solution activity." That is, as claimed, the MRI system must be used to acquire image data in particular manner (i.e., "with a different pulse sequence prescription that weights the acquired image data sets differently").

Nevertheless, the method of claim 1 is also directed to patent eligible subject matter under point (2) above because it transforms underlying subject matter. As noted in recent Federal Court decisions, it was ruled that "X-ray attenuation data produced in a two dimensional field by a computed tomography scanner ... clearly represent[s] physical and tangible objects, namely the structure of bones, organs, and other body tissues. Thus, the transformation of that raw data into a particular visual depiction of a physical object ... [is] sufficient to render that ... process patent-eligible" See In re Bilski, 545 F.3d 943, 962–63 (Fed. Circ. 2008). Therefore, it has been held that image data (e.g., x-ray attenuation data) clearly represents a physical object (the subject) and that transformation of such data into an image satisfies the so-called "machine-or-transformation test" set forth in points (1) and (2) above.

The reasoning for the transformation of x-ray attenuation data set forth above is logically extended to the field of MRI, in that image data sets acquired with an MRI system also represent an underlying physical object. Specifically, MR image data sets inherently represent the structure of a subject, for example, soft and other tissues in the human body. Thus, the transformation of this image data into a plurality of images, as called for in claim 1, satisfies point (2) above. More specifically, image data has been held to be a physical object, or article, that can be transformed through the step of image reconstruction. Thus, as the claimed invention includes the step of "reconstructing a plurality of images of the subject corresponding to the acquired image data sets," the method of claim 1 transforms an underlying article (image data sets). Accordingly, claim 1 is directed to patent eligible subject matter by transforming an underlying article (image data sets) into a visual depiction (plurality of images).

Applicant respectfully requests that the rejection of claim 1 under 35 U.S.C. § 101 is withdrawn for the above reasons. Furthermore, Applicant respectfully requests that the rejection of claims 2-19 under 35 U.S.C. § 101 are withdrawn for the same reasons as set forth regarding claim 1.

2. Claims rejected under 35 U.S.C. § 102(b) as being anticipated by Muraki et al.

Claims 1-4, 6, and 7 were rejected under 35 U.S.C. § 102(b) as being anticipated by US Pat. 6,580,936 (Muraki et al.). As described in the background of

the present application, the present methods seek to provide images for evaluating a disease, *e.g.*, atherosclerosis, by combining structural vessel information and functional vessel information. Such an objective can be achieved by using pulse sequence prescriptions that weight acquired MR images differently and subsequently displaying the images in a contrasting manner (*e.g.*, by displaying the images in different colors). As such, claim 1 has been amended to this end and to emphasize distinctions from the art of record. Specifically, amended claim 1 calls for, among other things, “reconstructing a plurality of images of a subject corresponding to acquired image data sets,” and “mapping each of the plurality of images to a different color.” The amendments to claim 1 are supported at least by the specification and figures as originally filed.

In contrast, Muraki et al. discloses a method of creating standardized color MR images. Specifically, Muraki et al. seeks to associate multichannel data from MR images with specific colors for particular tissues. This can be achieved using the following process: MR images are obtained from a tissue sample and then decomposed into independent component images (*e.g.*, a short relaxation time water emphasized image, a fatty-acid emphasized image, and a free-water emphasized image). Next, a number of sample points for the tissue sample are selected. At each sample point and only after decomposition of the images, luminance data from all of the independent component images is correlated with tissue color data of a cadaver from the U.S. National Library of Medicine Visible Human Dataset (col. 4, line 67 through col. 5, line 7). These correlations are used to create transfer functions, *e.g.*, a neural network, for converting subsequent multichannel MR images to color images.

Muraki et al. does not teach or suggest “reconstructing a plurality of images of a subject corresponding to acquired image data sets” and “mapping each of the plurality of images to different colors” as recited in claim 1 (emphasis added). Instead, Muraki et al. teaches decomposing images into multiple independent components images and then mapping sets of luminance data from the independent components images to specific colors (*e.g.*, the actual tissue colors as provided by the Visible Human Dataset). As such, claim 1 and claims depending therefrom (*i.e.*, claims 2-8) are believed to be in condition for allowance.

Nevertheless, Applicant asserts that claim 4 is in condition for allowance for at least another reason. Claim 4 calls for, among other things, analyzing the composite color image using "a cluster analysis of pixels in the composite color image based on the color of the pixels." The Office Action identifies cluster analysis as being equivalent to "decomposing" and cites figures 4-5 and column 4, lines 17-29 of Muraki et al. as teaching this step. However, this analysis has two problems. First, column 4, lines 17-29 of Muraki et al. describes decomposing originally obtained MR images into independent component images; that is, the composite color image resulting from Muraki et al.'s method is not decomposed. Second, the decomposition is based on image weightings (*e.g.*, a T1 weighted image, a T2 weighted image, and a proton weighted image); that is, the decomposition cannot be based on pixel color because the pixels of the originally obtained MR images have no color. For at least this reason, claim 4 is believed to be in condition for allowance beyond the chain of dependence.

3. Claims rejected under 35 U.S.C. § 103(a) as being unpatentable over Muraki et al. in view of Merickel et al.

Claims 5 and 8-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Muraki et al. in view of US Pat. 4,945,478 (Merickel et al.). However, claims 5 and 8 are believed to be in condition for allowance at least due to the chain of dependency as described above. Furthermore, claim 9 has been amended in a similar manner as claim 1. As such, claim 9 and claims depending therefrom (*i.e.*, claims 10-16) are also believed to be in condition for allowance.

Nevertheless, Applicant asserts that claim 11 is in condition for allowance for at least another reason. As described in paragraph [0028] of the specification, methods of the present application may include normalizing "each gray scale image such that each contributes equally to the composite color image." Similarly, claim 11 calls for, among other things, "normalizing each magnitude image to equally weight the magnitudes therein prior to forming the composite color image therewith."

The Office Action stated that Merickel et al. discloses such a normalizing step at column 14, lines 3-20. However, Applicant respectfully asserts that one skilled in the art would not normalize images obtained using Muraki et al.'s method because Muraki et al. does not intend for each of several images to contribute equally to color

Application No. 10/562,745

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Title: DISPLAY AND ANALYSIS OF MULTICONTRAST-WEIGHTED MAGNETIC RESONANCE
IMAGES

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images. That is, Muraki *et al.* uses several images to create color images having actual tissue colors, but the several images do not contribute equally to the color images. As such, one skilled in the art would not combine the disclosures of Muraki *et al.* and Merickel *et al.* as described by the Office Action. For at least this reason, claim 11 is believed to be in condition for allowance.

4. Conclusion

Applicant requests reconsideration of the claims of the present application in light of the above amendments and arguments. No fees are believed to be due for filing this response. However, if any fees are due, including fees for extensions of time, please charge Deposit Account No. 17-0055.

Respectfully submitted,

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